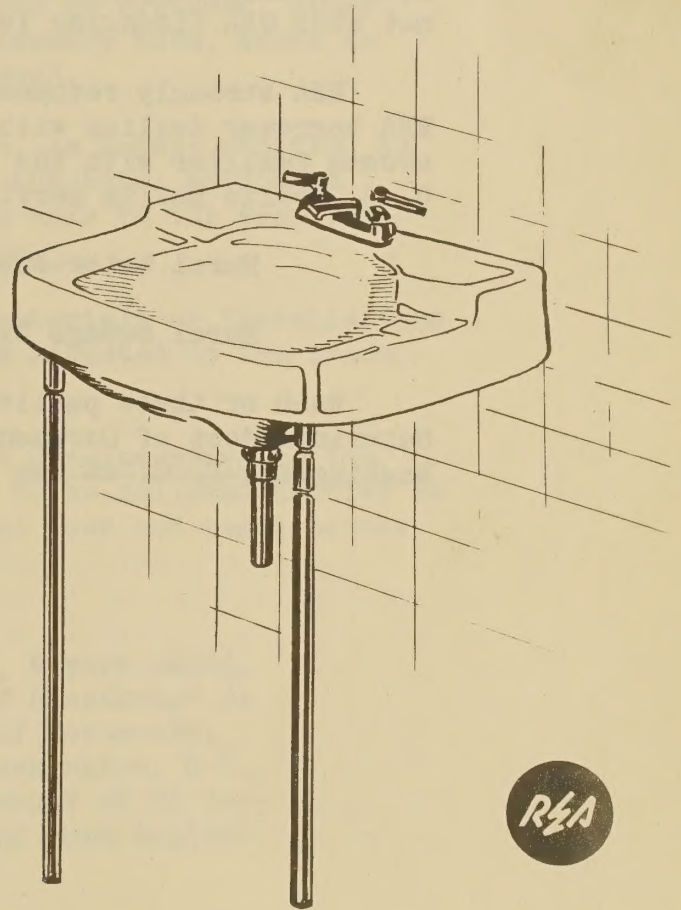


AL-73 (8-7-46)

MINIMUM PLUMBING REQUIREMENTS

FOR INSTALLATIONS
FINANCED WITH REA FUNDS



PROTECT HEALTH AND INCREASE USEFULNESS BY
INSTALLING WATER AND PLUMBING SYSTEMS
CORRECTLY.

The Rural Electrification Administration believes that all farm water and plumbing systems should be installed to give maximum service to the user and to eliminate health hazards. The requirements on the following pages have been prepared with these two goals in mind and are for distribution to plumbers and other persons making installations on the premises of consumers of REA-financed systems.

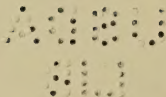
These requirements are recommended as a guide in all rural installations but are obligatory only for those installations which are financed with REA funds. The REA borrowers are individually responsible for seeing that these requirements are met when REA financing is used.

REA strongly recommends that the personnel of each REA borrower dealing with water supply and plumbing activities become familiar with the following two publications of the U. S. Public Health Service:

Rural Water-supply Sanitation (Supplement No. 185)

Rural Sewage Disposal (Reprint No. 2461)

Each of these publications may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. at ten (10¢) cents per copy.



MINIMUM REQUIREMENTS FOR PLUMBING FINANCED WITH REA FUNDSIGENERAL

- A. "Building Materials and Structures, Report EMS66, Plumbing Manual, National Bureau of Standards"* shall be used as minimum specifications for the materials and the installation of all plumbing financed with REA funds insofar as it does not conflict with state and local laws and regulations.

However:

1. Nothing in Report EMS66 shall be interpreted to prevent the use of non-siphon traps.
 2. Section 1002, Part II of Report EMS66 is hereby modified to permit the installation of a kitchen sink, a lavatory, or a laundry tub without a vent, provided the fixture wastes through a non-siphon trap, not more than two such fixtures waste to the same primary branch or, in the absence of a primary branch, to the building drain, and no fixtures, other than kitchen sinks, lavatories, and laundry tubs, waste to the same fixture drain or primary branch.
 3. Section 1010, Part II of Report EMS66, is hereby modified to include bathroom lavatories provided the total developed length of sloping drain from the trap weir to the vent fitting does not exceed 36 pipe diameters.
- B. These specifications are minimum. Any materials or installations of equal or higher quality, as generally accepted by the trade, may be substituted.
- C. The following minimum specifications are supplementary to the specifications of Report EMS66, and are to be followed insofar as they do not conflict with state and local laws and regulations.

* "Building Materials and Structures, Report EMS66, Plumbing Manual, National Bureau of Standards" is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., at a price of 20¢ per copy. A discount of 25 percent is allowed on orders for 100 or more copies.

II

MATERIALS

A. General Requirement for Materials

All materials shall be of average quality or better as generally understood by the trade. All materials shall be adapted with standard connection means to provide accurate connections with any other materials with which their use in combination may be required under any part of these specifications.

B. Water Pumping-and-Storage Equipment

1. Capacities - The pump and motor capacities based on a working pressure of 30 pounds per square inch, shall be sufficient to pump in two hours or less the estimated average 24 hours water requirement, provided the water source will supply water at this rate.

If the water source will not supply water at a rate which will allow the estimated average 24 hours water requirement to be pumped in two hours, the pump and motor shall be adapted to the rate at which the water source will supply water, and the combined active storage capacity plus two hours or less pumping capacity shall equal the estimated average 24 hours water requirement.

No pump shall be installed if the water source will not supply in 18 hours or less the estimated average 24 hours water requirement.

2. Electric Motor - The horsepower capacity of the electric motor shall be in accord with the total head combining the given maximum height of water lift and a working pressure of 40 pounds per square inch with the pump discharge rate as determined under Capacities above. The motor design shall be for 60 cycle, 115 or 230 volt alternating current. Single phase motors shall be of capacitor or repulsion induction type except that split phase motors of 3/4 or less horsepower may be used with pumps having centrifugal or turbine type impellers. The motor shall be equipped with an efficient lubrication system and shall be designed for the elimination of radio interference.
3. Motor Overload-Protection - The motor shall be equipped with automatic circuit-breaker overload-protection or with manually-reset circuit-breaker overload-protection having simply operated, safe, convenient reset mechanism.

4. Pump Actuating-Mechanism - The pump actuating-mechanism shall be reciprocating or rotating type as required by the type of pump. All parts shall be well and accurately made and assembled and easily accessible for maintenance and repairs. All gears shall be enclosed. It shall be provided with efficient automatic lubrication.
5. Pump - The minimum pump discharge-capacity shall be in accord with the determinations under Capacities above and shall be on the basis of the total head combining the given maximum height of water-lift and a working-pressure of 30 pounds per square inch. The pump shall be well and accurately made and assembled and easily accessible for adjustment and replacement of parts.
6. Hydropneumatic Storage-Tank - The hydropneumatic storage-tank shall be of welded or riveted steel construction for a working-pressure of at least 75 pounds per square inch. It shall be rustproofed inside and outside.
7. Interconnection Discharge-Piping Assembly - The interconnection discharge-piping assembly extends from the outlet connection of either the pump or the water-lift assembly to the inlet connection of the hydropneumatic storage-tank. It shall be of standard piping materials, including unions or other devices necessary for easy removal of assemblies, and it shall include an automatic pressure release valve for all pumps except centrifugal (including centrifugal and jet combinations).
8. Automatic Motor-Control Switch - The automatic motor-control switch shall be actuated by either the pressure in the interconnection discharge-piping assembly or the pressure in the water storage-tank. It shall be capable of operating accurately over the range of pressures between 20 pounds per square inch and 40 pounds per square inch. It shall include necessary wiring connections, with heavy waterproof cable for connection to the electric circuit. All electrical connections shall be in accord with REA "Specifications for Wiring", Form AL-23-R.
9. Automatic Air-Volume Control - The automatic air-volume control shall include well made and well assembled equipment to maintain within the hydropneumatic storage-tank an adequate amount of air for efficient operation of the water system.

C. Water Heating-and-Storage Equipment.

1. Automatic Electric Storage-Heater - The automatic, electric storage-heater shall include a hot-water storage-tank, one or more electric heating-elements, one or more electric thermostats,

tank thermal-insulation, a drain, and appropriate wiring and piping connections. The hot-water storage-tank shall be of riveted or welded steel construction, designed for a working pressure of at least 125 pounds per square inch. It shall be rustproofed inside and outside. There shall be a cold-water dispersion-means in the bottom of the tank and a 3/4" drain with hose-connection at the bottom of the tank. The electric heating-element or elements shall be electrically insulated from the water. The electric thermostat or thermostats shall be adjustable over the range of temperatures of at least 130° F to 150° F. The thermal-insulation value of the tank insulation shall be sufficient to prevent a temperature drop exceeding 1/2 degree F per hour with a temperature-difference of 70°. An automatic pressure-release valve shall be either incorporated into the tank or installed in the water-piping at a point where it cannot be isolated from the tank by a valve.

2. Range-Boiler Hot-Water Storage-Combination - The range-boiler hot-water storage-combination shall include the range-boiler tank, a cold-water tube, a drain, a range-boiler stand, appropriate connection-means for the necessary piping, and a pressure-release valve. The tank shall be of welded or riveted construction for a working-pressure of at least 100 pounds per square inch. It shall be rustproofed inside and outside. The appropriate piping-connections shall include unions which will allow the tank to be readily detached from both the heater and the piping-system. The pressure-release valve shall be installed in the water-piping at a point where it cannot be isolated from the range-boiler by valves.
3. Electric Immersion-Heater for Range-Boiler Connection - The electric immersion-heater for range-boiler connection shall include an electrically-insulated heating-element adapted to the range-boiler tank, and appropriate electrical-connections. Design shall be for 230 volt alternating current.
4. Thermostat for Range-Boiler Exterior-Attachment - The thermostat for range-boiler exterior-attachment shall be of the adjustable strap-on type, designed for 230 volt alternating current with an ampere rating of not less than 10. The temperature adjustment shall cover a minimum range of 130° F to 150° F.
5. Insulation-Covering for Range-Boiler Exterior-Attachment - The insulation-covering for range-boiler exterior-attachment shall be equivalent in insulating value to 3/4" thick asbestos air-cell sheet-covering. It shall be firmly held in position with lacquered steel bands or other equally effective attachments.

6. Auxiliary Water-Heater for Stove or Furnace Installation -
The auxiliary water-heater for stove or furnace installation shall consist of one of the following with appropriate union-connections:

- (a) water-front adapted to the particular stove or furnace,
- (b) water-back adapted to the particular stove or furnace,
- (c) water-jacket adapted to the particular stove or furnace,
- (d) 3/4" soft-copper tube, or
- (e) 3/4" iron pipe.

D. Water-Service Suction-Piping

1. Iron-Screwed Water-Service Suction-Piping - Iron-screwed, water-service, suction-piping shall include standard items in the following classes of standard piping-materials; iron-screwed pipe, malleable iron-screwed fittings, and screwed valves. The size of the piping shall be in accord with Tables I and III under Size of Water-Service, Suction-Piping.
2. Copper-Soldered Water-Service Suction-Piping - Copper-soldered, water-service, suction-piping shall include standard items in the following classes of standard piping-materials: hard-copper tube or soft-copper tube, brass-soldered or copper-soldered fittings, brass-soldered valves, solder joint materials. The size of the piping shall be in accord with Tables II and III under Size of Water-Service Suction-Piping.
3. Size of Water-Service Suction-Piping - The size of the water-service suction-piping shall depend on the following five variable factors:
 - (a) the kind of pipe used,
 - (b) the required pump-discharge rate,
 - (c) the differential suction-head (the difference between the actual height of water-lift and the maximum height of suction-lift allowable for the particular pump chosen corrected for altitude above sea level),
 - (d) the length of straight pipe required, and
 - (e) the length of piping equivalent to the fittings of various types used.

The following three tables give a basis for determining the proper size of piping in accord with all of these factors:

TABLE I

Size and Length of Iron-Screwed Water-Service Suction-Piping							
Pump Discharge	: Maximum Equivalent Length * in feet of each size						
Capacity	: Piping for Each Foot of Differential Suction-Head ***						
(Gallons Per Hour)	: 3/4"	: 1"	: 1-1/4"	: 1-1/2"	: 2"	: 2-1/2"	
200	: 17	: 71	: 200	: 550	: 2,100	: 6,000	
250	: 11	: 48	: 130	: 350	: 1,300	: 4,000	
300	: 8	: 33	: 100	: 250	: 950	: 2,800	
350	: 6	: 25	: 71	: 180	: 700	: 2,100	
400	: 4	: 19	: 55	: 140	: 550	: 1,600	
450	: 3	: 15	: 45	: 110	: 430	: 1,300	
500	: 3	: 13	: 39	: 96	: 370	: 1,100	

TABLE II

Size and Length of Copper-Soldered Water-Service Suction-Piping							
Pump Discharge	: Maximum Equivalent Length ** in Feet of Each Size						
Capacity	: Piping for Each Foot of Differential Suction-Head ***						
(Gallons Per Hour)	: 3/4"	: 1"	: 1-1/4"	: 1-1/2"	: 2"	: 2-1/2"	
200	: 27	: 97	: 270	: 590	: 2,400	: 7,000	
250	: 18	: 67	: 180	: 400	: 1,600	: 4,600	
300	: 13	: 48	: 130	: 290	: 1,200	: 3,300	
350	: 11	: 36	: 97	: 220	: 890	: 2,500	
400	: 8	: 29	: 77	: 180	: 700	: 2,000	
450	: 6	: 23	: 62	: 150	: 560	: 1,600	
500	: 5	: 17	: 48	: 120	: 460	: 1,400	

TABLE III

Length of Piping Equivalent to Each Fitting							
: Length in Feet of Piping Equivalent to Each Fitting.							
Type of Fitting	: 3/4"	: 1"	: 1-1/4"	: 1-1/2"	: 2"	: 2-1/2"	
Standard 90° Elbow	: 2.5	: 3	: 4	: 5	: 7	: 8	
Standard 45° Elbow	: 1.5	: 1.8	: 2.4	: 3	: 4	: 5	

* Calculated from data in Figure 9 of Report BMS66, National Bureau of Standards.

** Calculated from data in Figure 7 of Report BMS66, National Bureau of Standards.

*** The differential suction-head is determined by deducting from the maximum height of suction-lift recommended by the pump manufacturer both the actual elevation of the pump in feet above low-water level and the reduction in atmospheric-pressure of approximately one foot for each 1,000 feet of altitude above sea-level.

EXAMPLE OF DETERMINATION OF SIZE OF WATER-SERVICE, SUCTION-PIPING

- Given:
- (1) Iron-screwed pipe.
 - (2) Required pump-discharge-rate of 350 gallons per hour.
 - (3) Twenty-two feet maximum height of suction-lift of the pump, recommended by the manufacturer.
 - (4) Pump to be at an elevation of 16 feet above low-water level.
 - (5) Pump to be at an altitude of 1,960 feet above sea-level.
 - (6) Straight pipe to be 253 feet in length.
 - (7) The number of fittings to be five standard 90° elbows and three standard 45° elbows.

Determination:

The differential suction-head will be the maximum suction-lift of the pump of 22 feet, minus the actual lift of 16 feet, minus two feet for 1,960 feet of altitude. The result of these subtractions is four feet of differential suction-head. Table I on Size and Length of Iron-Screwed Water-Service Suction-Piping shows that, with a pump-discharge of 350 gallons per hour, the maximum equivalent-length of 1-1/4" piping for each foot of differential suction-head is 71 feet. Since there are four feet of differential suction-head available, the maximum permissible equivalent-length of 1-1/4" piping is 284 feet. Table III shows the five standard 90° elbows in 1-1/4" pipe to be equivalent to 20 (5x4) feet of straight pipe and the three standard 45° elbows to be equivalent to 7.2 (3x2.4) feet of straight pipe. The actual equivalent length of 1-1/4" straight pipe is therefore 253 feet, plus 20 feet, plus 7.2 feet, or 280.2 feet. The proper size of pipe is 1-1/4" since the actual equivalent-length of 280.2 feet is less than the maximum permissible equivalent-length of 284 feet.

E. Water-Service Pressure-Piping

1. Iron-Screwed Water-Service Pressure-Piping - Iron-screwed water-service pressure-piping shall include standard items in the following classes of standard piping-materials, iron-screwed pipe, malleable iron-screwed fittings, screwed valves. The size of the piping shall provide for a discharge at each building and at each outside outlet at a rate of at least 200 gallons per hour. The size of the piping shall be in accord with Tables IV and VI under Size and Length of Water-Service Pressure-Piping.
2. Copper-Soldered Water-Service Pressure-Piping - Copper-soldered water-service pressure-piping shall include standard items in the following classes of standard piping-materials; hard-copper tube or soft-copper tube, brass or copper soldered-fittings,

brass soldered-valves, solder joint materials. The size of the piping shall provide for a discharge at each building and at each outside outlet at a rate of at least 200 gallons per hour. The size of piping shall be in accord with Tables V and VI under Size of Water-Service Pressure-Piping.

3. Size of Water-Service Pressure-Piping - The size of water-service pressure-piping shall depend on the following five variable factors:

- (a) the kind of pipe used,
- (b) the required discharge-rate,
- (c) the available water-pressure,
- (d) the length of straight-piping used, and
- (e) the length of piping equivalent to the fittings of various types used.

The following three tables give a basis for determining the proper size of piping in accord with all of these factors:

TABLE IV

Size and Length of Iron-Screwed Water-Service Pressure-Piping						
Water Discharge Rate (Gallons Per Hour)	: Maximum Equivalent Length * in Feet of Each Size					
	: Piping for Each Pound per Square Inch of Pres-					
	: sure-Loss Due to Friction ***					
	: 1/2"	: 3/4"	: 1"	: 1-1/4"	: 1-1/2"	
200	: 5	: 38	: 170	: 460	: 1200	
250	: 4	: 26	: 110	: 310	: 780	
300	: 3	: 18	: 77	: 230	: 560	
350	: 2	: 13	: 58	: 160	: 420	
400	:	: 10	: 48	: 120	: 320	
450	:	: 8	: 35	: 100	: 260	
500	:	: 7	: 29	: 82	: 220	

TABLE V

Size and Length of Copper-Soldered Water-Service Pressure-Piping						
Water Discharge Rate (Gallons Per Hour)	: Maximum Equivalent Length ** in Feet of Each					
	: Size Piping for Each Pound per Square Inch of					
	: Pressure-Loss Due to Friction ***					
	: 1/2"	: 3/4"	: 1"	: 1-1/4"	: 1-1/2"	
200	: 10	: 62	: 220	: 590	: 1400	
250	: 7	: 42	: 150	: 410	: 920	
300	: 5	: 30	: 110	: 290	: 660	
350	: 4	: 26	: 83	: 230	: 500	
400	: 3	: 18	: 66	: 180	: 400	
450	:	: 15	: 54	: 140	: 330	
500	:	: 13	: 44	: 120	: 270	

TABLE VI

Length of Piping Equivalent to Fittings						
Type of Fitting	: Length in Feet of Piping Equivalent to Each					
	: Fitting					
	: 1/2"	: 3/4"	: 1"	: 1-1/4"	: 1-1/2"	
Globe Valve, Open	: 15	: 20	: 25	: 35	: 45	
Angle Valve, Open	: 8	: 12	: 15	: 18	: 22	
Standard Tee through	:	:	:	:	:	
Side Outlet	: 3	: 4	: 5	: 6	: 7	
Standard 90° elbow	: 2	: 2.5	: 3	: 4	: 5	
Standard 45° elbow	: 1.2	: 1.5	: 1.8	: 2.4	: 3	
Gate Valve, Open	: .4	: .5	: .6	: .8	: 1	

* Calculated from data in Figure 9 of Report BMS66, National Bureau of Standards.

** Calculated from data in Figure 7 of Report BMS66, National Bureau of Standards.

*** The pressure-loss due to friction should be kept at a minimum, and in no case should exceed 5 pounds per square inch. It must be remembered that the pressure available to overcome friction is only that which is in excess of the pressure required to overcome the hydrostatic-head. Hydrostatic-head is commonly measured in feet and is converted to its equivalent in pounds per square inch by multiplying the number of feet by .434.

EXAMPLE OF DETERMINATION OF SIZE OF WATER-SERVICE PRESSURE-PIPING

Given:

- (a) Iron-screwed pipe
- (b) Required discharge rate of 300 gallons per hour.
- (c) Allowable loss of pressure due to friction,
5 pounds per square inch.
- (d) Straight piping, 336 feet.
- (e) Number of fittings in piping:
 - 6 standard 90-degree elbows
 - 4 standard 45-degree elbows
 - 1 standard tee through side outlet
 - 1 gate valve

Determination:

The data in Table IV on the Size and Length of Iron-Screwed Water-Service Pressure Piping shows that for a discharge-rate of 300 gallons per hour through 1" piping, a maximum equivalent-length of 77 feet of piping may be used for each pound per square inch of pressure loss due to friction. Since the pressure loss to be allowed is given as 5 pounds per square inch, the maximum permissible

equivalent-length of 1" piping would be 5 x 77 or 385 feet. The actual equivalent-length of 1" piping is 336 feet of straight pipe, plus 18 feet of piping equivalent to 6 standard 90 degree elbows, plus 7.2 feet of piping equivalent to 4 standard 45 degree elbows, plus 5 feet of piping equivalent to one standard tee through side outlet, plus .6 foot equivalent to a gate valve open. Therefore, the actual equivalent-length is $336 + 18 + 7.2 + 5 + .6$ or 366.8 feet and the proper size of piping is 1", since 366.8 feet is less than the maximum permissible equivalent-length of 385 feet.

F. Septic Tanks.

1. Concrete Septic Tanks - Concrete septic tanks may be of either precast or cast-in-place construction. A precast tank shall have a wall thickness of at least 1-1/2" and shall be adequately reinforced with steel to withstand all strains to which it will normally be subjected. A cast-in-place tank shall have a wall thickness of at least 4". The minimum depth of liquid at its deepest place shall be at least 48 inches. The length shall be not less than two or more than three times the width. The open end of the inlet shall be submerged in the liquid. The open end of the outlet shall be submerged in the liquid at least 12 inches. If the incoming sewage is not directed vertically downward by the end-fitting, the tank shall be provided with a baffle extending at least 18 inches below and 6 inches above the surface of the liquid. The air-space from the liquid-level to the top of the tank shall be not less than 12 inches. The liquid-level in the tank shall be not more than 4 inches or less than 2 inches below the bottom of the inside surface of the incoming sewer-pipe where it enters the tank. The liquid-capacity of the tank shall be at least 500 gallons plus 60 gallons for each person over four normally served. The cover shall be removable over a circular opening at least 24 inches in diameter or a square opening at least 20 inches on a side, shall be at least 4 inches thick, and shall be adequately reinforced with steel to withstand dead loads of not less than 150 pounds per square foot. The direction of flow through the tank shall be parallel to the longest dimension.
2. Steel Septic Tanks - Steel septic tanks shall be of welded or riveted steel construction. The minimum thickness of the steel shall be No. 12 B&S gauge. The minimum depth of the liquid at its deepest place shall be 48 inches. The length shall be not less than two or more than three times the width. The open end of the inlet shall be submerged in the liquid. The open end of the outlet shall be submerged in the liquid at least 12 inches. The air-space from the liquid-level to the top of the tank shall be at least 12 inches. The liquid-level in the tank shall be not more than 4 inches or less than 2 inches below the bottom of the inside surface of the incoming sewer-pipe where it enters the

tank. The liquid-capacity of the tank shall be at least 500 gallons plus 60 gallons for each person over four normally served. The cover shall be removable over a circular opening at least 24 inches in diameter or a square opening at least 20 inches on a side. The tank and cover shall be thoroughly coated inside and outside with a coating of asphaltum or other equally effective waterproofing-material.

G. Disposal Field for Septic Tank.

1. Horizontal Seepage-Drain Piping - The horizontal seepage-drain piping shall be of 4" clay, concrete, metal or composition drain-tile with the joints covered for the upper 180 degrees of the arc of the circumference of the tile with shields of heavy tarpaper or other equally effective silt-excluding shields. Maximum length of any line shall not exceed 100 feet and at least two lines of tile shall be provided, with a minimum spacing of six feet between lines.

The length of the seepage-drain without underdrain shall be determined either by a percolation test or as follows: Sandy soil - 25 feet per person; sandy loam soil - 35 feet per person; clay loam soil - 60 feet per person; clay soil - 80 feet per person. The length of seepage-drain with underdrain at a depth of 3 feet and with 2 feet of clean coarse sand between the seepage-drain and the underdrain shall be 10 feet per person. The minimum length of seepage-drain shall provide for the needs of at least 6 persons.

2. Percolation Test - A percolation test for determining the amount of seepage-drain is as follows:

- (a) dig a hole 1 foot square and to a depth equal to that at which the tile-drain is to be laid,
- (b) fill the hole with water and allow the water to seep away,
- (c) while the bottom of the hole is still moist, fill the hole to a depth of 6 inches and observe the time required for the water-level to fall 1 inch.
- (d) from the following table determine the approximate length of tile required per person:

<u>Minutes required for Water to Fall 1 Inch</u>	<u>Feet of 4" Tile Required per Person</u>
2	20
5	30
10	35
30	60
60	80
Over 60	Underdrain should be used

III

INSTALLATIONS

- A. General Requirements for Installation - All work shall be done in a thorough and workmanlike manner so that all equipment shall be in proper operating-condition subject to authorized inspection.
- B. Water-Service Suction-Piping - Water-service suction-piping shall be installed with a continuous upward slope from the water-level of the water-source to the pump inlet-connection. Underground piping shall be installed with the depth in the ground at all points below expected freezing-depth.
- C. Water-Service Pressure-Piping - Water-service pressure-piping shall be sloped continuously upward from the pump or pressure storage tank to the distribution-piping or water-supply faucets, except that it may be sloped downward in the direction of flow if some means of draining it such as a faucet, a plugged tee or a stop-and-drain valve is located at every low place that would not drain to the storage-tank or some other drain fitting. Underground piping shall be installed with the depth in the ground at all points below expected freezing-depth.
- D. House-Water Distribution-Piping - House-water distribution-piping shall extend from the entrance of the water-service pressure-piping into or below the house, or from the outlet of the pressure storage-tank within the house and be connected to water heating-and-storage equipment, to cold and hot-water connections of all plumbing fixtures, and to all separate water-supply faucets located within, attached to or near the house. The piping shall be sloped to drain completely at faucets, plugged tees or stop-and-drain valves. The piping shall be rigidly and permanently secured in place with appropriate piping-supports. Installation of piping includes the cutting of openings through floors and walls where the piping or the connections to fixtures and faucets are extended on opposite sides of such construction. Such openings shall be neatly cut to fit the piping as closely as practical.
- E. Yard Sewer-Piping - Yard sewer-piping shall be installed from the house drain-terminal to the inlet connection of the septic tank or other means of waste disposal, and from the outlet connection of the septic tank to the seepage-drain. All sewer piping within 100 feet of a well or other source of water-supply shall be of watertight construction. Piping shall be sloped downward not less than 1/8" per foot toward its outlet.

F. General Requirements for Piping Installation.

1. Arrangement of piping shall be as direct as practical, uniform in alignment and free from sags. All Piping shall be rigidly and permanently supported in place by solid earth or masonry, or by appropriate piping-supports.
2. Piping insulation, when required, shall be neatly fitted around pipes and fittings, and shall be strapped tightly in place.
3. Tests of piping should be under pressures corresponding to the maximum expected to be met in actual service. Sewer-piping within 100 feet of a well or source of water-supply should be tight under 10 feet head of water.

